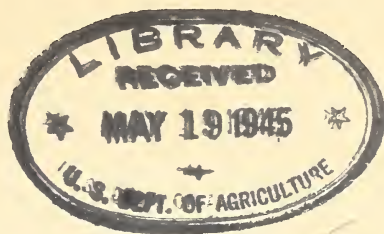


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THE SMUTS OF SORGHUM.

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THE SMUTS OF SORGHUM.^a

INTRODUCTION.

The smuts are among the most destructive enemies of sorghums. It may be that the actual loss from smut in these highly important crops is not at present as serious as that sustained by oats and wheat, but it is nevertheless quite considerable and is certainly serious in some localities. The chief danger from these smuts is the probability of their rapid spread if proper precautions are not taken to hold them in check. The area where sorghum crops are grown is being rapidly extended, and with this extension the smuts may easily be distributed over new areas. By using simple precautions at the present time, farmers may avoid much disappointment and loss in the future. The losses caused by smuts of oats, barley, and wheat throughout the United States ought to prove a sufficient warning to all farmers and communities which are now either growing or introducing sorghum crops, because the smuts of sorghums may yet cause as much damage as those of the other cereals mentioned.

The objects of this circular are (1) to call attention to these dangerous pests, (2) to warn farmers of the danger of introducing them into new localities, and (3) to suggest simple methods of getting rid of them if they are already present.

KINDS OF SORGHUM SMUTS.

There are in this country two well-known smuts of sorghums: The grain, or kernel, smut (*Sphacelotheca sorghi* (Link) Clinton) and the head smut (*Sphacelotheca reiliana* (Kuhn) Clinton).

The grain, or kernel, smut is easily distinguished by the fact that only the individual kernels, or grains, are affected, while the head retains its usual form and nearly its usual appearance. Most, if not all, of the kernels in a smutted head are usually destroyed. Each kernel is changed into a more or less conical, grayish to reddish mass containing the dark-colored smut dust, or spores.

^a In recent years there has been a very rapid settlement of the semiarid lands. The sorghums are among the most suitable crops for cultivation on such lands, and many inquiries are received by this Bureau for information in regard to the sorghum smuts. In this circular is presented briefly such up-to-date and practical knowledge of these diseases as has been obtained so far.—B. T. GALLOWAY, *Pathologist and Physiologist, and Chief of Bureau.*

The head smut is very different in appearance. The whole head, just as it emerges from the upper leaf, is converted into a single large smut mass, covered by a whitish or grayish membrane, which soon bursts and sets the spores free. In this smut, therefore, all trace of the individual grains, or kernels, is lost. The smut mass resembles somewhat in appearance a smut mass on corn.

It is not yet known how many of the various groups and varieties of sorghum each smut infects. The grain smut occurs on all of the principal groups, while the head smut has been observed on sorgos (sweet sorghums), kafirs, and shallu. Neither smut has been observed on milo up to the present time, and attempts to inoculate milo with the kernel smut of kafirs and sorgos have proved unsuccessful.

GRAIN, OR KERNEL, SMUT.

Of the two smuts of sorghum, only the kernel smut is at present widely distributed. It is found almost universally where sorghum crops are grown. The losses sustained are in many districts very severe. They are increasing and will continue to increase unless preventive measures are adopted.

The life history of this grain smut is now well known. It is similar to that of stinking smut, or bunt, of wheat, viz, the spores, or smut dust, get on the kernels in thrashing or in handling, and when the seed is planted they grow at the same time that the seed sprouts. The smut plant penetrates the stalk of the young seedling plant and remains inside of the latter until the heads are formed, when the fungus forms its spores inside of the grains, replacing the latter.

As in the bunt of wheat, careful seed treatment will kill the smut spores, because the latter cling to the outside of the seeds, and after such treatment the crop will be free from smut.

It is therefore very important that any farmer who is not sure that his seed is free from smut should treat his seed in one of the ways suggested in this circular. When his seed is once clean he can keep his farm free from smut by raising his own seed, provided he does not allow it to become smutted again in a smutty thrashing machine or in the subsequent handling of the grain.

TREATMENT OF GRAIN SMUT.

Seed that is smutty may be treated in the following ways:

FORMALIN TREATMENT.

Mix 1 pound of full-strength formalin with 30 gallons of water. Put the seed in sacks and immerse the sacks in this solution for one hour, stirring it occasionally. Then take the sacks out and set them to drain. Spread the seed out on a clean floor or canvas. Be sure

that all of the sacks, the barn floor, and the canvas used in handling the grain after treatment are cleaned either with boiling water or with a strong formalin solution. The seed will be infected again if any untreated smut spores touch it. When the seed is sufficiently dry after treatment it may be sown.

The same solution may also be used as a spray, in which case the seed to be treated should be spread out on a clean floor or canvas and sprinkled with the solution. It must be shoveled over frequently until all of the seeds are wet. It may then be shoveled into a pile and left over night, covered with a clean canvas or sacking to keep in the fumes, and then spread out to dry in the morning. Seed treated in this way will be free from smut. The immersion method is more thorough, but is not as convenient as the sprinkling method.

HOT-WATER TREATMENT.

Hot water is a most cheap and efficient means of treating sorghum seed. The treatment is more easily applied to sorghum than to wheat and barley, because sorghum seeds (at least those of kafirs and sorgos, or sweet sorghums) will stand much higher temperatures than wheat and barley seeds, while the sorghum smuts are killed as easily as the corresponding smuts of the small grains. The smaller quantity of seed used to the acre in the sorghum crops is an additional advantage, making it possible to treat easily all the seed required for a large area. In the hot-water treatments of sorgo and kafir a wide range of temperature is possible, and the operation is therefore more easily performed on the farm.

In brief, the process is as follows: Heat two large vats or tubs of water to about 133° F. Place the seed to be treated in a clean sack and bring it to about 133° F. by plunging it into the first tub of water heated to this temperature. Then transfer the sack to the second tub or vat and keep the seed submerged for ten or fifteen minutes. Keep the temperature of the water in the second tub between 130° and 137° F. It should not be allowed to go above 138° or below 129° F. The seed should be frequently stirred in order to keep the temperature uniform throughout. Small sacks should be used, since in large sacks it is impossible to keep the temperature constant. After this treatment, the seed is spread out to dry on a clean floor or canvas. When sufficiently dry it may be sown.

As in the formalin treatment, every precaution must be taken to prevent infection of the seed after treatment. Although this treatment is not as convenient as the formalin method, it is just as efficient, is cheaper, and, on account of the wide range of temperature, is easily applied. It is superior to the formalin method in that the farmer does not have to rely on a druggist for the strength of a forma-

lin solution. If the formalin is not of full standard strength (i. e., a 40 per cent solution), the formalin treatment may not be successful. In the hot-water treatment all of the implements and materials are directly under the control of the farmer.

COPPER SULPHATE TREATMENT.

Solutions of copper sulphate (bluestone) also give satisfactory results, but are certainly no better than, and probably not even as good as, the two methods described above.

HEAD SMUT.

At present the head smut does not occur in abundance beyond a very restricted area in the Panhandle of Texas. Its life history is not yet understood, but enough is known to show that the treatments recommended for the grain smut have absolutely no effect upon the head smut. This indicates that this disease is a more insidious one than the grain smut and may be more difficult to control when once it succeeds in getting a fair start.

The only recommendation that can be made at the present time is to keep the smut away from the farm and the community. In order to do this the farmer must be sure that his seed did not come from a crop that contained head smut. If such a general quarantine is observed this smut need never become a serious menace. If it is allowed to spread unchecked, however, it bids fair to become troublesome in the future. In case it is already present on the farm the infected plants should be cut out completely and burned before the smut spores have a chance to scatter.

RECOMMENDATIONS.

The precautions necessary and the proper treatments for the smuts of sorghum crops may be summarized as follows:

(1) If possible, get seed free from smut—from fields that are known to have had no smut during the preceding year. Also be sure that such seed has not become smutted in harvesting and handling.

(2) Keep your farm free from smut by using your own seed and employing only machinery that will not contaminate your crop.

These first two precautions will insure you against both kinds of smut.

(3) Treat your seed with either formalin or hot water if you are not sure that it is free from smut. This will not necessarily insure the farm against head smut.

(4) Maintain a quarantine against any locality or farm where smut is known to exist, as well as against any seed grower who allows

smut in his fields. This course will largely prevent the spread of both kinds of smut.

(5) Maintain a quarantine against any handlers of machinery who allow their machinery to become or remain contaminated with smut spores. This would be effective against the grain smut. It would probably have no effect on the head smut, however.

(6) Milo has not yet been reported as subject to either smut, and hence may probably be safely grown without treatment.

Approved:

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *April 22, 1908.*

[Circ. 8.]

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